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*BULLDOZER BETTER THAN POISONS**FOR PREPARING SCRUB OAK PLANTING SITES*

Before scrub oak lands can be reforested, some cheap and effective way of preparing planting sites must be found. Chemical weed killers have been tried, but they proved to be impractical for general use (see Northeastern Research Note 6).

Another possible way, the use of mechanical earth-working equipment that will dig up the brush and push it aside, appears to be more promising. The brush must be set back severely enough, and over a wide enough space, so that planted tree seedlings can rise above the competing vegetation and get established without release cuttings.

Field tests

Heavy agricultural disks and plows and two types of fire-line plows (Ranger Pal and Killefer) were tried in the scrub oak barrens of

Pennsylvania, but they were found wanting. They either did not do a satisfactory job, or were not rugged enough to stand up against the heavy root crowns and stones.

Trials with bulldozers were started in 1949. In 1950, using a D-7 Caterpillar machine, 47 acres were successfully furrowed for planting. A BDH 35-horsepower Cletrac proved to be too light. A D-6 or equivalent might do the job, but no machine lighter than a D-6 would be adequate.

(The equipment and manpower used in the 47-acre test were provided by the Pennsylvania Department of Forests and Waters, which cooperated in the study.)

The tractor must be equipped with an angledozer blade and hydraulic controls. On the D-7 machine the blade was angled and tilted to the maximum, with the forward edge raised. With improvised bracing, more tilt was obtained than you can get with the regular adjustments. In operation, only the trailing edge of the blade enters the ground. Soil and debris slide from the end of the blade, sometimes rolling off almost as from a moldboard plow.

The furrows prepared this way averaged a little more than 3 feet wide. The depth varied unavoidably. The furrows should be no deeper than need be to remove the blueberry root mat and the scrub oak root crowns. Four inches is about the minimum, 8 inches the maximum.

Except for occasional spots where the blade fails to get under all the root mat, re-invasion of the furrows by bordering vegetation

is a slow process; and tree seedlings planted in the furrows should in most places come through without need for later release cuttings.

Costs

The 47 acres furrowed in 1950 were on a gently sloping area that bore a somewhat open stand of scrub oak mostly less than 5 feet tall. The soil varied from moderately to extremely stony. Stone patches with not enough soil to justify planting were skipped by the machine. Furrows were oriented across the slope to minimize water runoff and washing.

The job totalled 41.5 miles of furrow and took 69 hours of operating time. At \$9 per hour for machine and driver, this cost \$13.21 per acre, or \$14.96 per furrow mile. Average spacing between furrows was 9.3 feet; for this spacing the length of furrow per acre is 0.88 mile.

Skill of the tractor operator is extremely important in controlling costs. A good man on this job did 0.7 miles of furrow per hour--almost 0.8 acre. Another operator--not a novice, either--made less than half that rate. The more skillful man did the job for \$11.52 per acre.

Trees were planted immediately after the furrows were prepared--in April and May. Preferably the furrowing should have been done the preceding fall to allow the first mass sloughing and settling to take place before the planting. A mattock-slit method was used. The planters averaged 573 trees per day, and 9.8 man-hours per acre. Average number of trees per acre was 704, at an average spacing in the furrows of 6.7 feet. At 94 $\frac{1}{2}$ cents per hour, the

labor cost of planting was \$9.26 per acre.

Total planting costs, exclusive of transportation and supervision, were:

Furrowing	\$13.21
Labor	9.26
Trees (at \$6 per 1,000)	4.22
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Total	\$26.69

Disadvantages of furrowing

Though site preparation by furrowing with a bulldozer provides a way to plant scrub oak lands at a fairly reasonable cost, it is not the perfect answer to the problem. It has these distinct disadvantages:

1. The area furrowed is left very rough.
2. The topsoil is pushed aside; the trees are planted in the less-fertile clayey subsoil, which in some places may be subject to excessive frost heaving.
3. Unless carefully oriented on the contours, furrows may give rise to excessive runoff, gullies, and siltation of streams.

Plans have been made to try a Seaman rotary tiller. If this machine will stand up under the rugged conditions and give adequate control of scrub oak vegetation, it will obviate the major drawbacks associated with furrowing.

--W. E. McQUILKIN